Marc Sabat

Artificial Music for Machines

PLAINSOUND MUSIC EDITION

M a r c S a b a t

Artificial Music for Machines

music for acoustic concert grand piano with MIDI output and electronically-amplified sinusoidal tones selected, generated, and tuned by computer

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NOTES :

The piano part of the music is to be performed on a concert grand piano with MIDI output, which has been tuned to twelve-tone equal temperament (A-440 Hz). An ideal tuning would minimize the amount of octave stretching due to inharmonicity while still maintaining the piano's natural sound.

MIDI information produced by the piano - pitch, velocity, and controller changes - is to be sent (via an interface) into a computer running MAX/MSP software.* The three piano pedals should be programmed to send controller messages on MIDI controllers #67 (soft pedal), #66 (sostenuto pedal) and #64 (sustain pedal). Depressing these pedals at any time will then respectively activate the patch changes for PATCH 1 (#67), PATCH 2 (#66), PATCH 3 (#64).

The output of the program consists of two independent channels of sinusoidal tones, to be amplified by two onstage loudspeakers to the left and right of the piano. The electronic sounds require a studio-quality two-channel sound system with monitors capable of producing sinetones as low as 27.5 Hz. If necessary, a subwoofer can be added to achieve the low frequency fidelity. It is especially important that these very low frequencies are physically perceptible in the room as vibrations. The volume of amplification should be balanced equally with the acoustic piano sound in such a manner that the electronic sounds at times blend entirely into the acoustic timbre while at other times producing piercing sounds on the edge of tolerance.

The three patches used in the music are described briefly as follows:

1. Only the 12 highest (MIDI Notes 97-108) and 12 lowest (MIDI Notes 21-32) pitches of the piano and their respective velocities are recognized (all other data is filtered out). Two processes take place in parallel. If one of the lowest tones has been played, the computer determines its frequency and then randomly selects a frequency corresponding to one of its first 24 harmonic partials. (The number 24 has been selected because in a system which considers octave transpositions as serving harmonically equivalent functions it produces 12 distinct microtonal pitch-classes for each of the 12 equal-tempered fundamentals.) The selected frequency is immediately produced on the left channel with a volume proportional to the intensity of the triggering note's acoustic attack. If one of the highest tones has been played, a similar process takes place in which the computer selects a frequency corresponding to one of the first 24 under-tones (frequencies whose theoretic harmonic spectra would contain the higher tone as a partial). These sounds are sent to the right channel.

2. All tones played are recognized by the computer in the order played by the performer (even in the case of a chord, MIDI data is still received sequentially) and the last two notes at any given time are retained in memory. The computer determines the frequency of each tempered pitch and calculates the difference and summation tones produced by these two frequencies. The resulting pitches, which reproduce as sounds part of the psychoacoustic phenomena associated with harmonic perception, are respectively sent to the left and right channels with intensities corresponding to the pianist's performance.

3. All tones played are recognized by the computer in the order played by the performer and the last two notes at any given time are retained in memory. The computer determines the frequency of each tempered pitch and randomly selects an octave transposition within the range of the piano. These new pitches, which are sinusoidal doubles of the equal-tempered pitches theoretically existing on the piano, are sent alternately to the left and right channels.

*A freely-distributed runtime version of MAX/MSP for Mac OS and Windows is included on the enclosed CD along with the patch for this piece.

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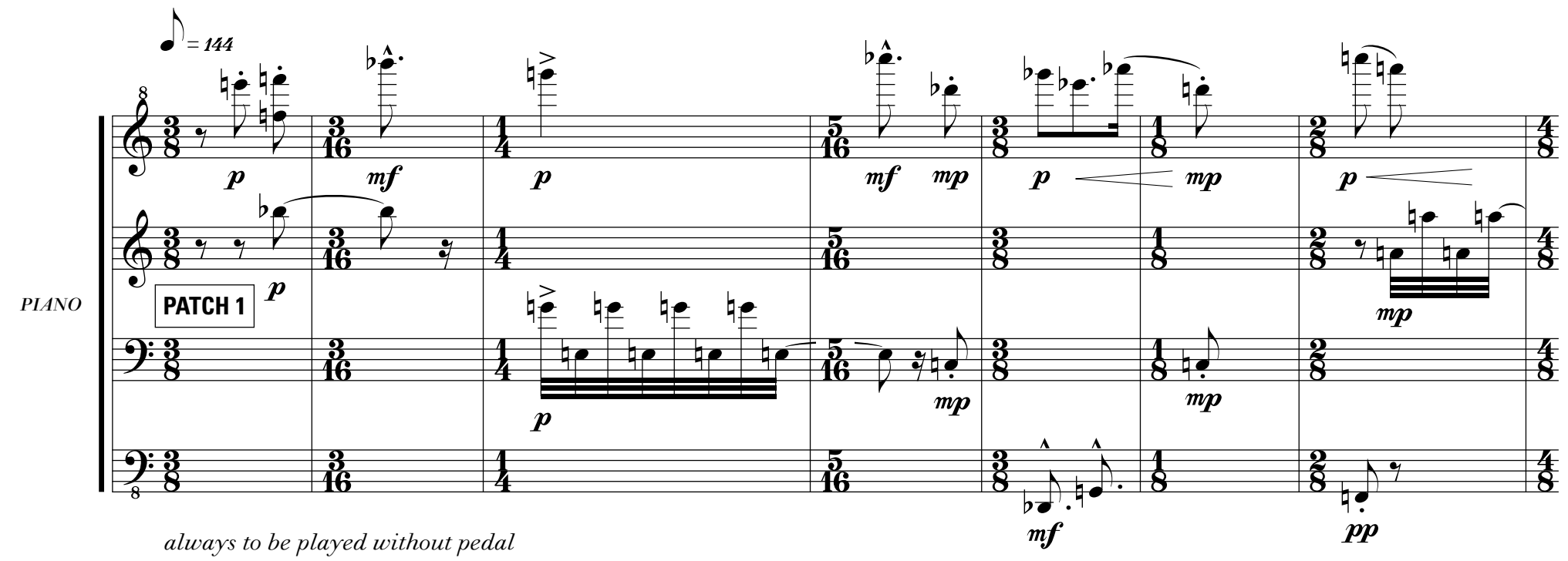
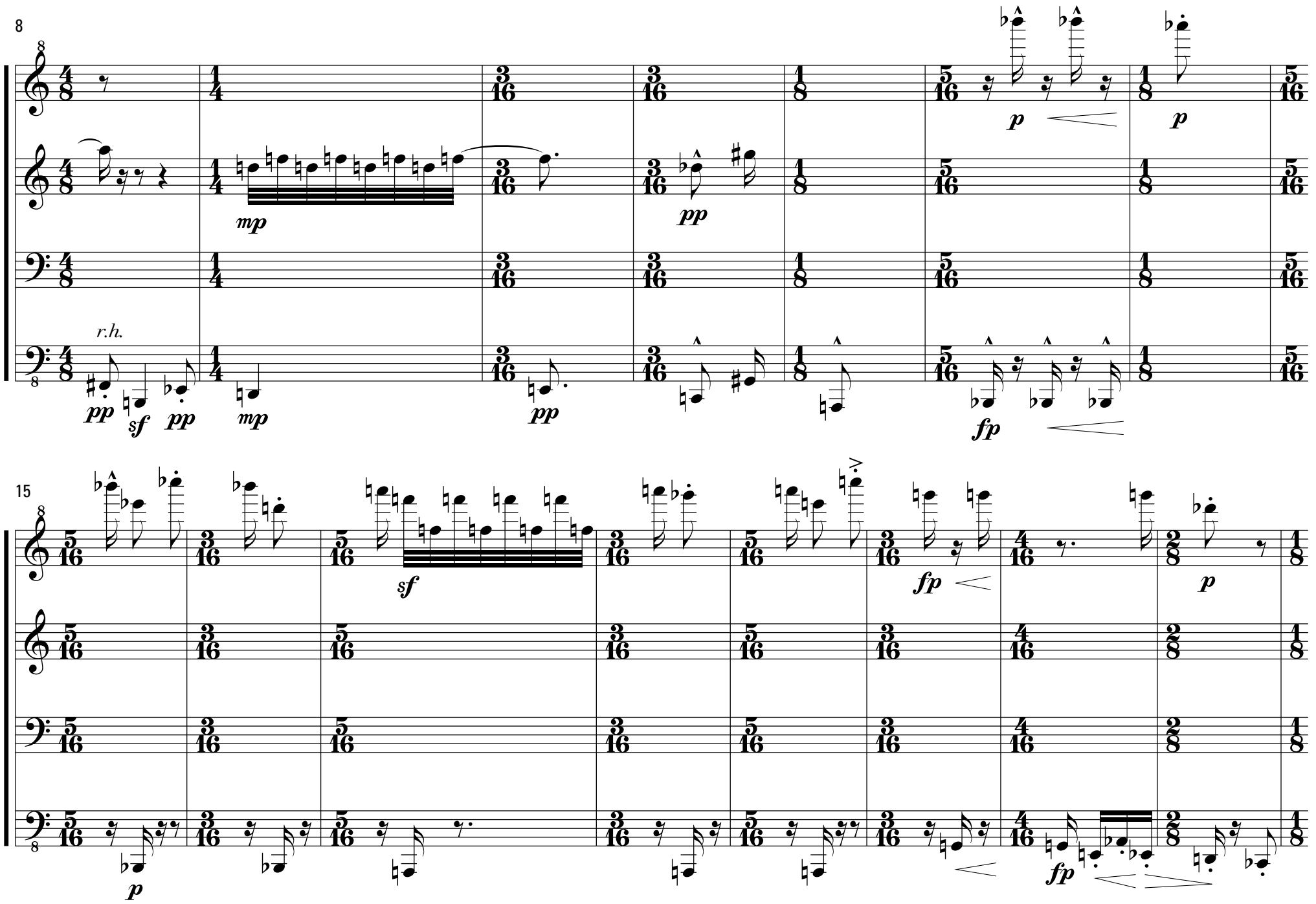
to be played on an acoustic concert grand piano with MIDI output, which is used to initiate the selection of electronically-amplified sinusoidal tones, generated and tuned by computer to the frequencies of various overtones, under-tones, difference-tones, and summation-tones of the piano pitches and their combinations, presenting to the ear some harmonic properties of twelve-tone equal-temperament in the form of variations on Arnold Schoenberg's Op. 25.

"The criterion for the acceptance or rejection of dissonances is not that of their beauty, but rather only their perceptibility."
- Arnold Schoenberg, Problems of Harmony *(1934)*

for Stephen Clarke

Marc Sabat





23

fp f p fp

31

p p f f p fp r.h. sf sf p p p f p fp fp p r.h.

40

f p r.h. sf f mp sf p p f r.h.

48

= 112 l.h. pp pp

55

poco ritardando

sf *sf* *f* *f* *f* *diminuendo*

62

♩ = 96 *accelerando*

crescendo

f *f* *f* *f* *f*

68

♩ = 126 ♩ = 112

r.h. *l.h.*

3 3

sf *sfp* *ff* *p*

73

ritardando

sf *p*

79

♩ = 96

r.h.

85

♩ = 72

♩ = 144

f

f

f

93

ff

r.h.

ff

sf

101

l.h.

105

pp

pp

pp *crescendo*

112

= 160

f

f

f

f

sf

sf

118

= 144

ff

ff

r.h.

ff

ff

122

l.h.

r.h.

l.h.

sf

126 ♪ = 144

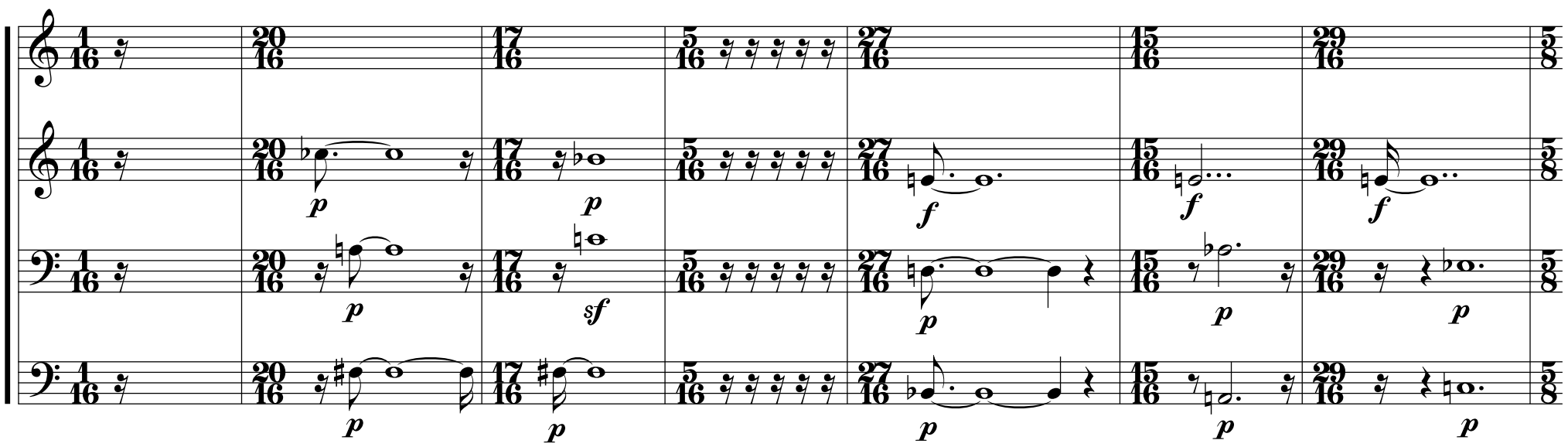
PATCH 2

134

141

149

157



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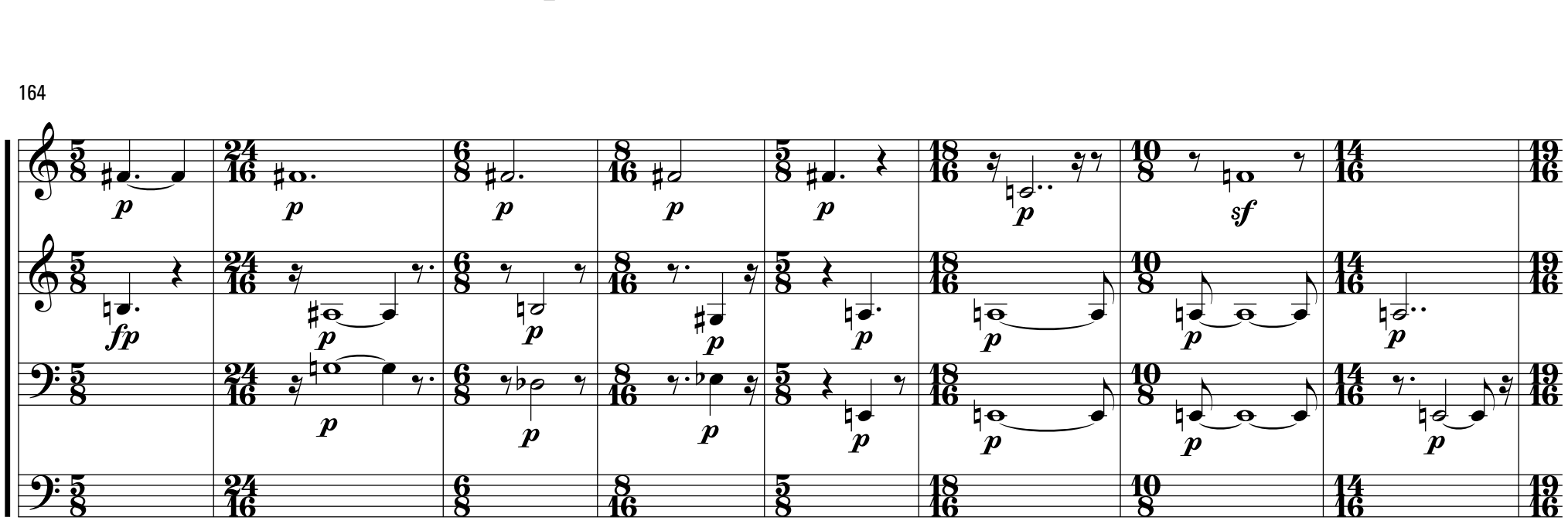

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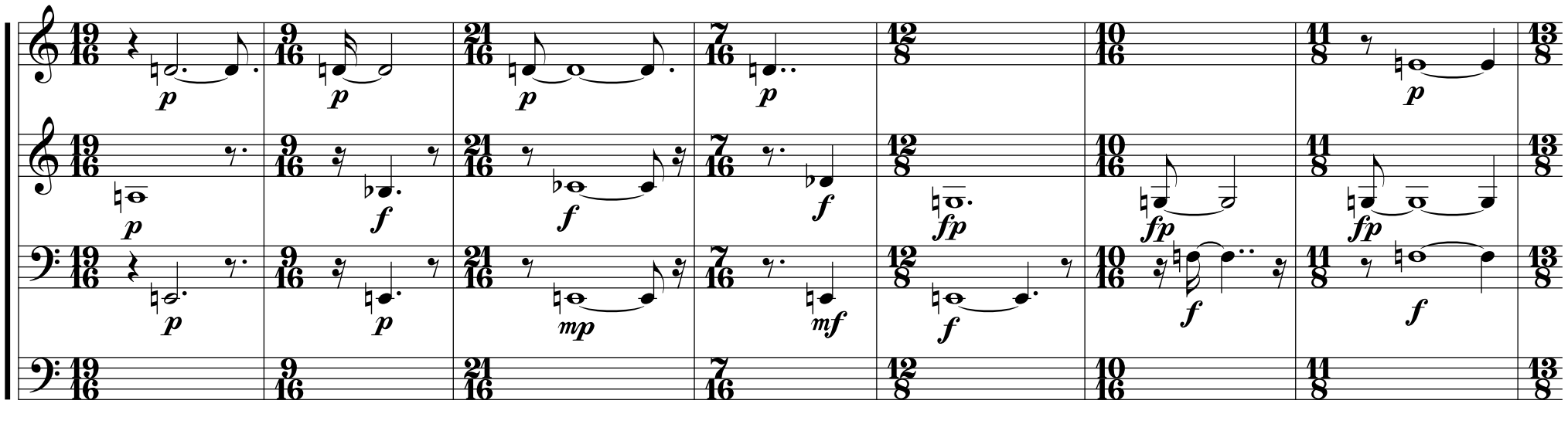

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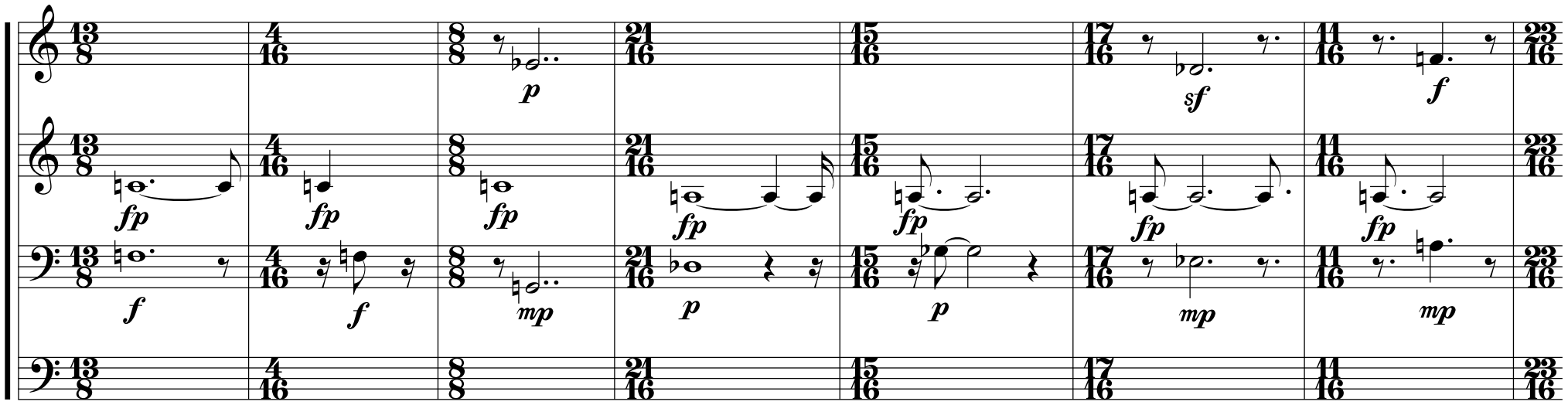

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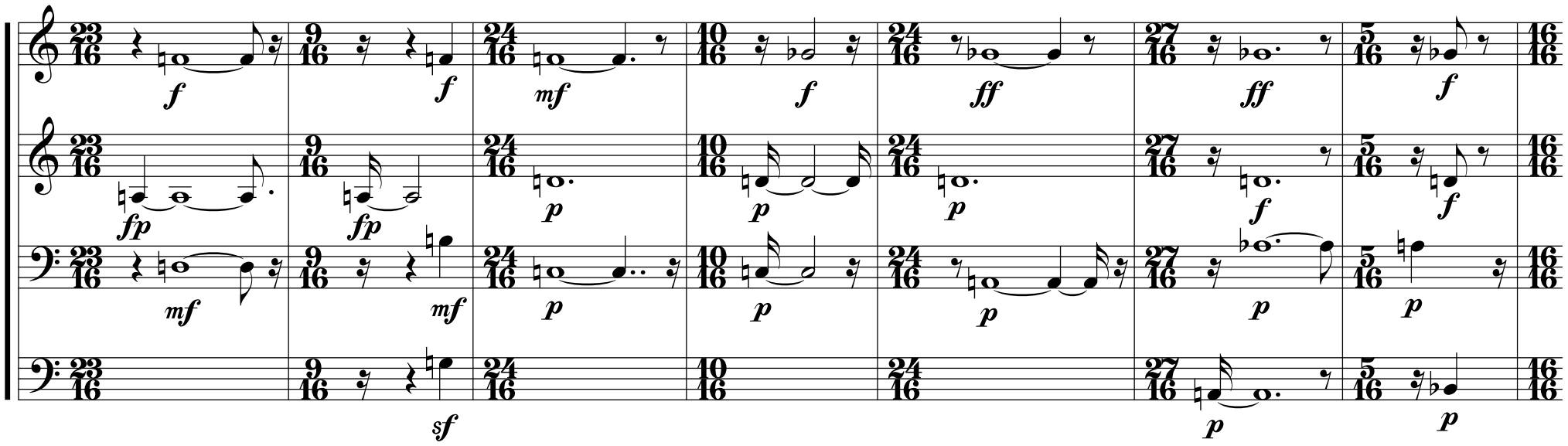

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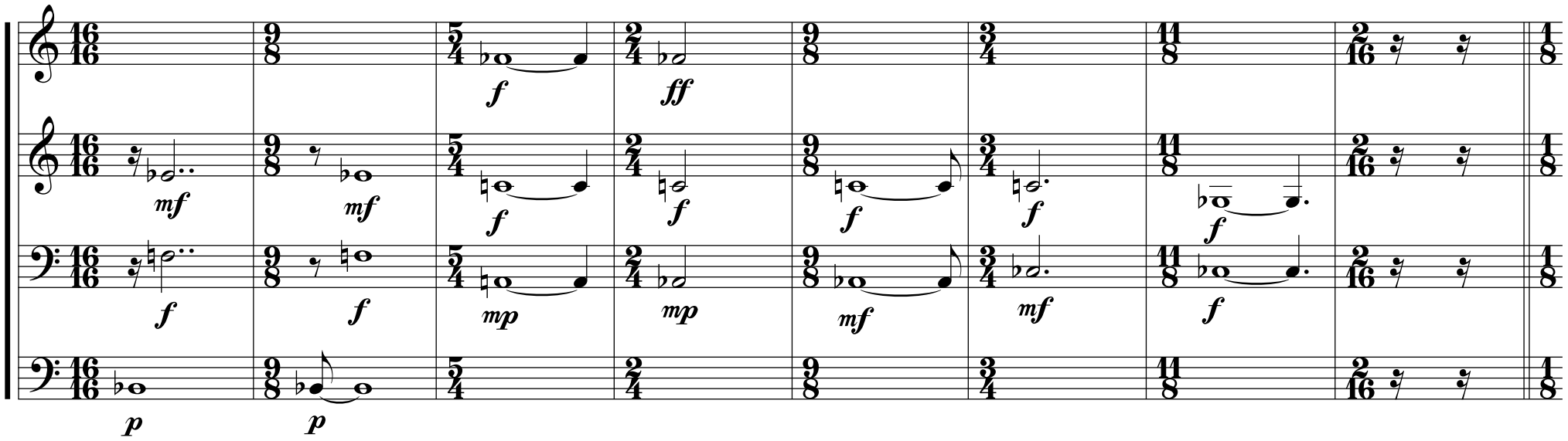
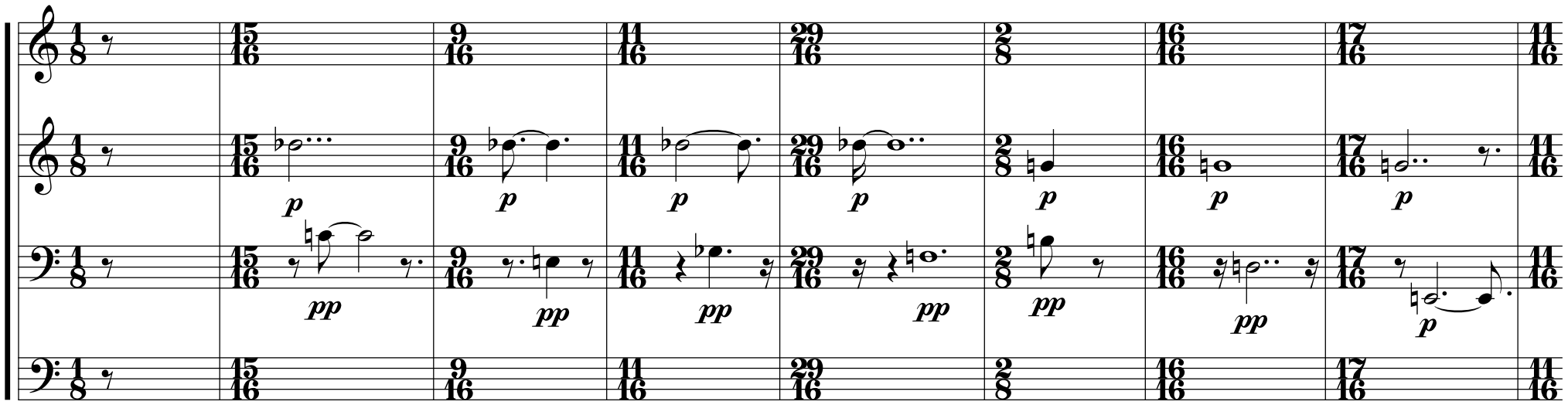


201 ♪ = 112



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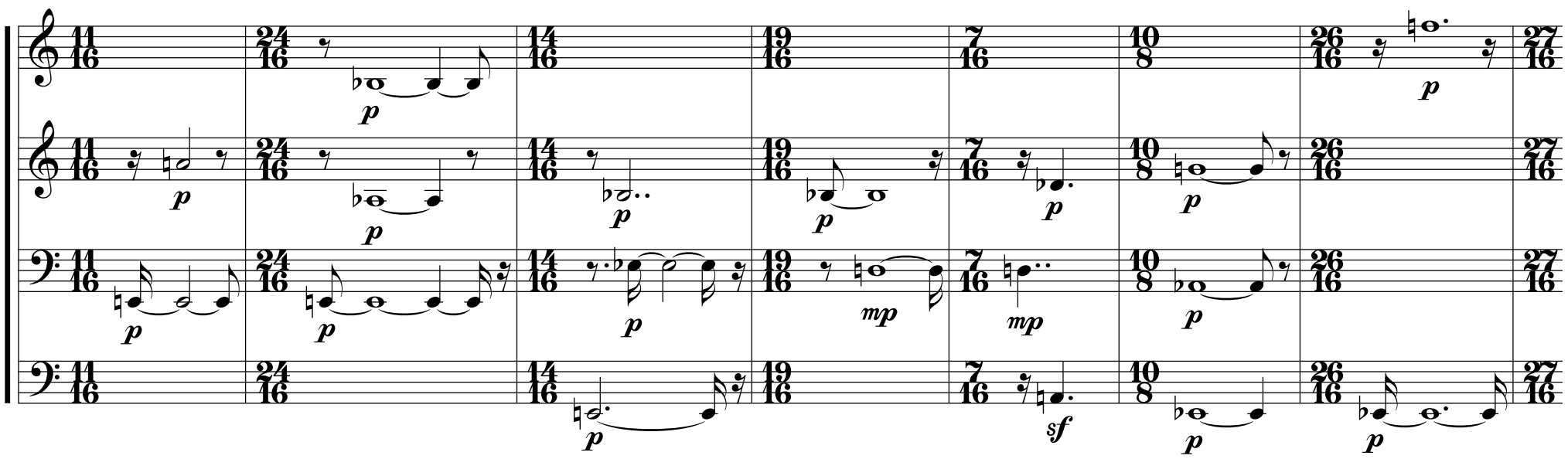


216

♪ = 126 *poco ritardando*

225

♪ = 96 *accelerando*

♪ = 112

233

♪ = 126

240

♪ = 112 *ritardando* ♪ = 96 ♪ = 72

PATCH 3

245

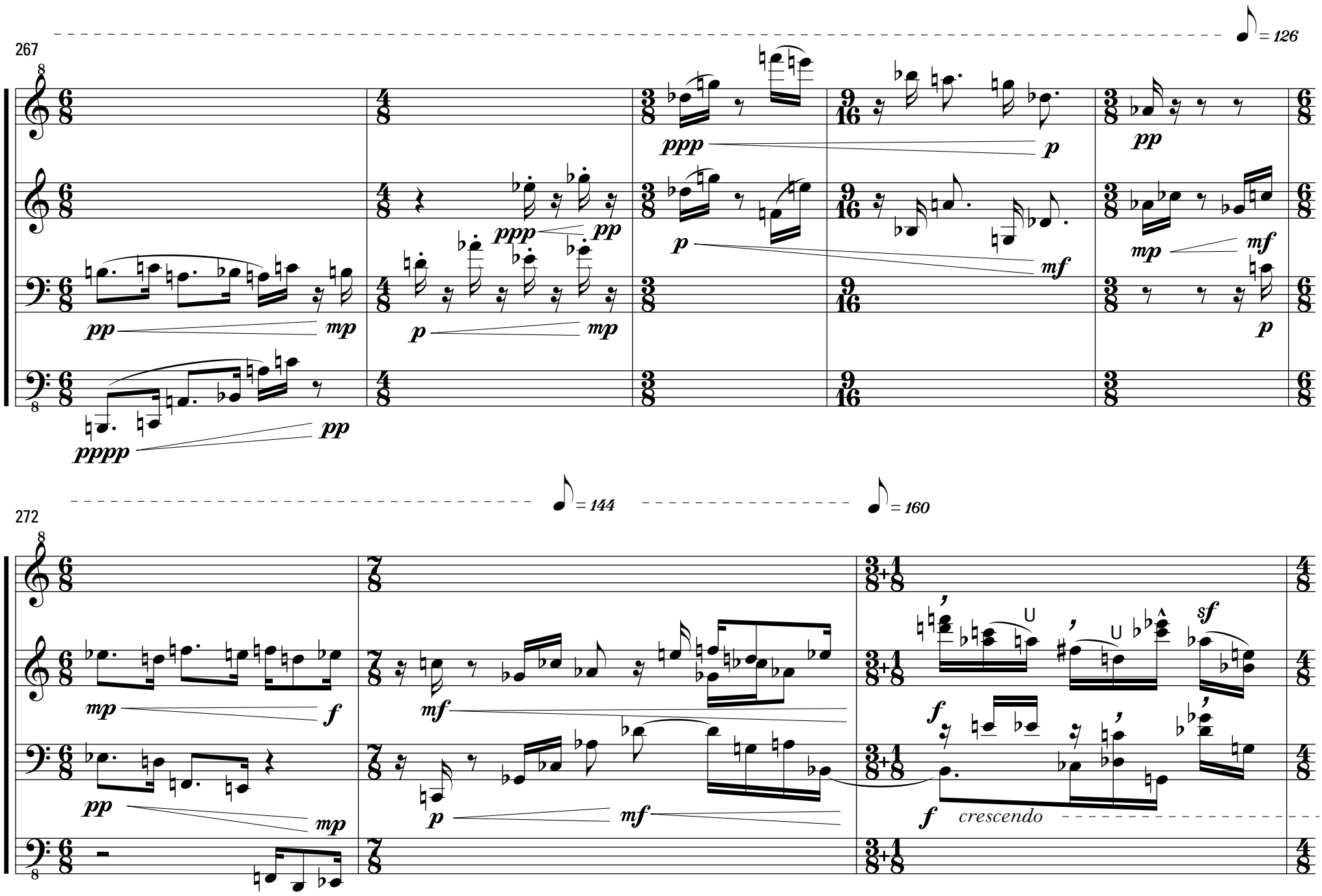
♩ = 96

252

257

262

♩ = 112 *accelerando*



Berlin, February-March & June-August 2002